

(19) World Intellectual Property
Organization
International Bureau



(43) International Publication Date
10 September 2004 (10.09.2004)

PCT

(10) International Publication Number
WO 2004/076299 A1

(51) International Patent Classification⁷: **B65D 1/02,**
B29C 49/02

E. [US/US]; 4 Lynch Farm Road, Amherst, NH 03031
(US). LYNCH, Brian, A. [US/US]; 22 Woodward Road,
Merrimack, NH 03054 (US).

(21) International Application Number:
PCT/US2004/005888

(74) Agents: BRUSS, H., G. et al.; One SeaGate, Toledo, OH
43666 (US).

(22) International Filing Date: 26 February 2004 (26.02.2004)

(81) Designated States (*unless otherwise indicated, for every
kind of national protection available*): AE, AG, AL, AM,
AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN,
CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI,
GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE,
KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD,
MG, MK, MN, MW, MX, MZ, NA, NI, NO, NZ, OM, PG,
PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM,
TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM,
ZW.

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
10/375,736 26 February 2003 (26.02.2003) US

(71) Applicant (*for all designated States except US*): CONTI-
NENTAL PET TECHNOLOGIES, INC. [US/US]; One
SeaGate, Toledo, OH 43666 (US).

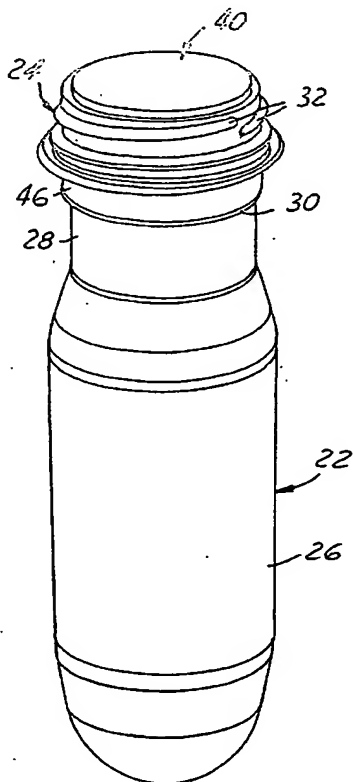
(72) Inventors; and

(84) Designated States (*unless otherwise indicated, for every
kind of regional protection available*): ARIPO (BW, GH,
GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW),

(75) Inventors/Applicants (*for US only*): NAHILL, Thomas,

[Continued on next page]

(54) Title: CONTAINER PREFORM ASSEMBLY AND METHOD OF MANUFACTURE



(57) Abstract: A preform assembly (20) for blow molding a container includes a molded plastic preform (22) having an open mouth, a neck (28) surrounding the mouth with an external surface at a first diameter, an external flange (30) at one end of the neck surrounding the mouth, and a preform body (26) integrally molded with the neck at an end of the neck spaced from the flange. The preform body has a second external diameter that is greater than the first diameter of the neck external surface. A circumferentially continuous molded plastic finish ring (24) is externally secured over the external surface of the neck between the flange and the preform body. In the preferred embodiments of the invention, the finish ring is secured to the preform neck by expanding the ring over the flange, most preferably using a mandrel 40, and then allowing the ring resiliently to shrink onto the external surface of the neck.

WO 2004/076299 A1



Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Declarations under Rule 4.17:

- as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii)) for the following designations AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, UZ, VC, VN, YU, ZA, ZM, ZW, ARIPO patent (BW, GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO, SE, SI, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG)
- as to the applicant's entitlement to claim the priority of the earlier application (Rule 4.17(iii)) for the following designations AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID,

IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, UZ, VC, VN, YU, ZA, ZM, ZW, ARIPO patent (BW, GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO, SE, SI, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG)

Published:

- with international search report
- before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

CONTAINER PREFORM ASSEMBLY AND METHOD OF MANUFACTURE

The present invention is directed to preforms for blow molding plastic containers, and to methods of making such preforms.

Background and Summary of the Invention

In the manufacture of plastic containers, it is conventional to injection mold or compression mold a container preform having a body and a neck finish with one or more external threads. The neck finish typically is molded to its final geometry, while the body of the preform is subsequently blow molded to the desired geometry of the container body. The preform may be of monolayer construction, or may be of multilayer construction in which one or more intermediate layers in the preform body may or may not extend into the finish area of the preform. U.S. Patents 4,609,516, 4,710,118 and 4,954,376 illustrate injection molding of multilayer container preforms.

Molding the neck finish portion of the container as part of the preform presents a number of problems. For example, when the preforms are formed by injection molding, the plastic material typically is injected into a mold cavity at the closed end of the preform body, so that the material must flow along the sides of the preform cavity into the area in which the neck finish is molded. The finish typically requires more accurate and stable dimensioning than the body of the preform, which may limit the cycle time of the molding process. Furthermore, the neck finish portion of the preform is of the same material as at least the outer layers of the preform body, which limits the ability to obtain the most desirable characteristics at the finish. When the preform is of polyester construction, such as polyethylene terephthalate (PET), the neck finish portion of the preform can be wholly or partially crystallized to improve the operating characteristics of the finish

area, particularly in hot-fill container applications. However, the requirement that the neck finish be of the same material as at least the outer layers of the preform body still limits the design capabilities of preform manufacture.

A preform assembly for blow molding a container in accordance with one aspect of the present invention includes a molded plastic preform having an open mouth, a neck surrounding the mouth with an external surface at a first diameter, an external flange at one end of the neck surrounding the mouth, and a preform body integrally molded with the neck at an end of the neck spaced from the flange. The preform body has a second external diameter that is greater than the first diameter of the neck external surface. A circumferentially continuous molded plastic finish ring is externally secured over the external surface of the neck between the flange and the preform body. In the preferred embodiments of the invention, the finish ring is secured to the preform neck by expanding the ring over the flange and then allowing the ring resiliently to shrink onto the external surface of the neck.

Brief Description of the Drawings

The invention, together with additional objects, features, advantages and aspects thereof, will be best understood from the following description, the appended claims and the accompanying drawings, in which:

FIG. 1 is perspective view of a preform assembly in accordance with one exemplary presently preferred embodiment of the invention;

FIG. 2 is a perspective view of the preform in the assembly of FIG. 1;

FIGS. 3 and 4 are perspective views that illustrate sequential stages of assembly of the preform assembly of FIG. 1; and

FIG. 5 is a fragmentary sectional view of a portion of FIG. 4.

Detailed Description of Preferred Embodiments

FIG. 1 illustrates a preform assembly 20 in accordance with one presently preferred embodiment of the invention as including a preform 22 and a separate finish ring 24 secured thereto. As best seen in FIG. 2, preform 22 includes a body 26 having a closed lower end. (Directional words such as “upper” and “lower” are employed by way of description and not limitation with respect to the upright orientation of the preform and assembly illustrated in the drawings. Directional words such as “radial” and “circumferential” are employed by way of description and not limitation with respect to the central axis of the preform neck or finish ring as appropriate.) A neck 28, which typically is cylindrical, integrally extends from the upper end of preform body 26, and a flange 30 extends radially outwardly from the open end of neck 28. Neck 28 and flange 30 surround the open mouth 31 of preform 22. Finish ring 24 is circumferentially continuous, and preferably has one or more external threads or thread segments 32. In the illustrated preferred embodiment of the invention, finish ring 24 includes an annular wall 34 from which threads 32 project. A tamper-indicating bead 36 extends radially outwardly from wall 34 beneath threads 32, and a capping or support flange 38 extends radially outwardly from wall 34 beneath bead 36. As an alternative, capping flange 38 can be molded onto preform neck 28. The inside diameter of finish ring wall 34 is less than the outside diameter of flange 30, and is less than the outside diameter of preform body 26.

Finish ring 24 is assembled to preform 22 employing a tapered anvil 40 (FIGS. 3-5). Anvil 40 has a nose 42 sized for close receipt within preform mouth 31, and a shoulder 44 for abutting engagement with the upper surface of flange 30. The upper portion of anvil 40 has a tapered

outer surface 46, preferably a conical outer surface, having a diameter at ledge 44 equal to or slightly greater than the outside diameter of flange 30, and an outside diameter at the remote end of surface 46 that is less than the inside diameter of finish ring 24. Finish ring 24 is pushed along surface 46 of anvil 40 resiliently to expand the diameter of the finish ring. When the finish ring is moved past flange 30, the finish ring resiliently contracts around neck 28 of preform 22. The relaxed diameter of ring 24 preferably is such that ring 24 is retained by interference fit on neck 28 after expansion over anvil 40 followed by contraction onto neck 28. Adhesive or ultrasonic welding can also be employed to enhance securement of ring 24 on preform 22. The finish and/or preform neck can be provided with suitable means for preventing rotation of the ring on the neck.

Preform 22 may be of any suitable plastic construction, such as monolayer PET or multilayer construction of PET layers alternating with layers of barrier resin such as ethylene vinyl alcohol (EVOH) or nylon. Preform 22 may be injection molded or compression molded. Likewise, finish ring 24 may be of injection or compression molded plastic construction. By providing finish ring 24 separate from preform 22, finish ring 24 may be of any desired material construction, either the same as or more preferably different from the material construction of preform 22. In other words, the material and conditions of fabrication of finish ring 24 may be selected separately from the material and manufacturing conditions of preform 22 to achieve desired operating characteristics at the finish area of the preform and the final container. Furthermore, the preform can be molded with thin wall sections without having to accommodate flow of material into a thicker finish area, which reduces material cost and mold cycle time. Finish ring 24 may be of polypropylene (PP) construction, which has sufficient resiliency to expand over anvil 40 and then "snap" or shrink back onto preform neck 28 and be secured by interference shrink fit on the preform neck. Polyester

material, such as PET, PEN or process regrind, can be stretched while warm over anvil 40, and will shrink back onto preform neck 28 as the ring cools.

There have thus been disclosed a preform assembly and method of manufacture that fully satisfy all of the objects and aims previously set forth. The invention has been disclosed in conjunction with a exemplary presently preferred embodiment thereof, and a number of modifications and variations have been described. Other modifications and variations will readily suggest themselves to persons of ordinary skill in the art. The invention is intended to embrace all such modifications and variations as fall within the spirit and broad scope of the appended claims.

Claims

1.

A preform assembly for blow molding a container, which includes:

a molded plastic preform (22) having an open mouth, a neck (28) surrounding said mouth with an external surface at a first diameter, an external flange (30) at one end of said neck surrounding said mouth, and a preform body (26) integrally molded with said neck at an end of said neck spaced from said flange, said body having a second external diameter greater than said first diameter, and

a circumferentially continuous molded plastic finish ring (24) externally secured to said neck between said flange and said body.

2.

The preform assembly set forth in claim 1 wherein said finish ring (24) is shrunk fit over said external surface of said neck (28).

3.

The preform assembly set forth in claim 2 wherein said finish ring (24) is of material construction selected from the group consisting of PP, PET, PEN and process regrind.

4.

The preform assembly set forth in claim 1 wherein said finish ring (24) has at least one external thread (32) and an external support flange (38) at one axial end of said ring.

5.

The preform assembly set forth in claim 1 wherein said plastic finish ring (24) is of a material construction selected from the group consisting of: PET, PP, PEN and process regrind.

6.

The preform assembly set forth in claim 1 wherein said plastic finish ring (24) is of a different material construction from said plastic preform (22).

7.

A method of making a preform assembly that includes the steps of:

(a) providing a molded plastic preform (22) that has an open mouth, a neck (28) surrounding said mouth with an external surface at a first diameter, an external flange (30) at one end of said neck surrounding said mouth, and a preform body (26) integrally molded with said neck at an end of said neck spaced from said flange, said body having a second external diameter greater than said first diameter,

(b) providing a circumferentially continuous molded plastic finish ring (24) externally secured to said neck between said flange and said body, and

(c) assembling said finish ring (24) to said preform (22) by locating said finish ring over said external surface of said neck and shrinking said ring onto said neck such that said ring is secured to said neck by interference shrink fit.

8.

The method set forth in claim 7 wherein said step (c) is carried out by resiliently expanding said ring (24) over said flange (30) and then allowing said ring to shrink onto said external surface of said neck (28).

9.

The method set forth in claim 8 wherein said step (c) is carried out by: (c1) positioning an anvil (40) over said mouth, said anvil having an outer surface (46) with a diameter at said flange (30) at least equal to that of said flange, and a diameter spaced from said flange less than the inside diameter of said ring, and (c2) expanding said ring (24) by sliding said ring along said outer surface until said ring snaps over said flange.

10.

A preform assembly made in accordance with the method set forth in claim 9.

11.

A preform assembly made in accordance with the method set forth in claim 7.

1/2

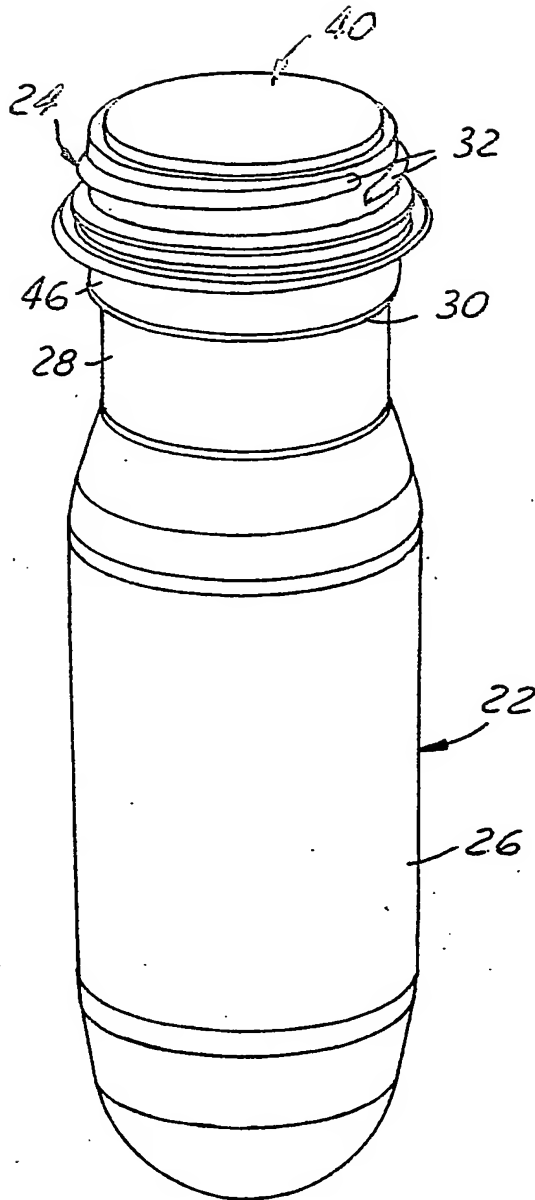


FIG. 4

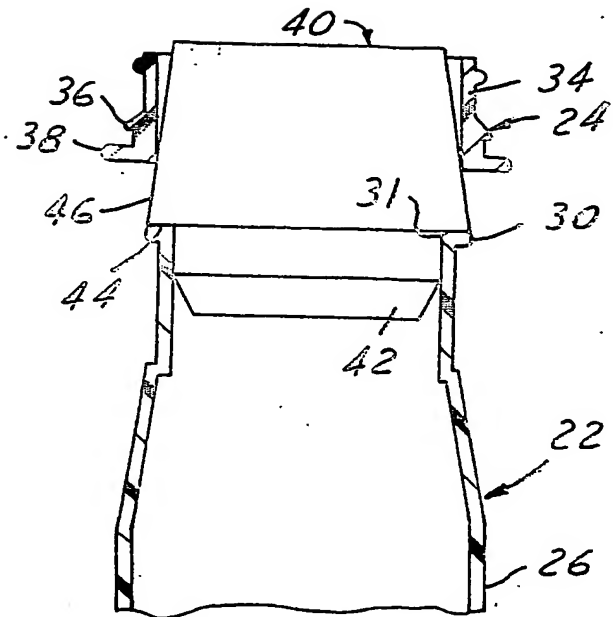


FIG. 5

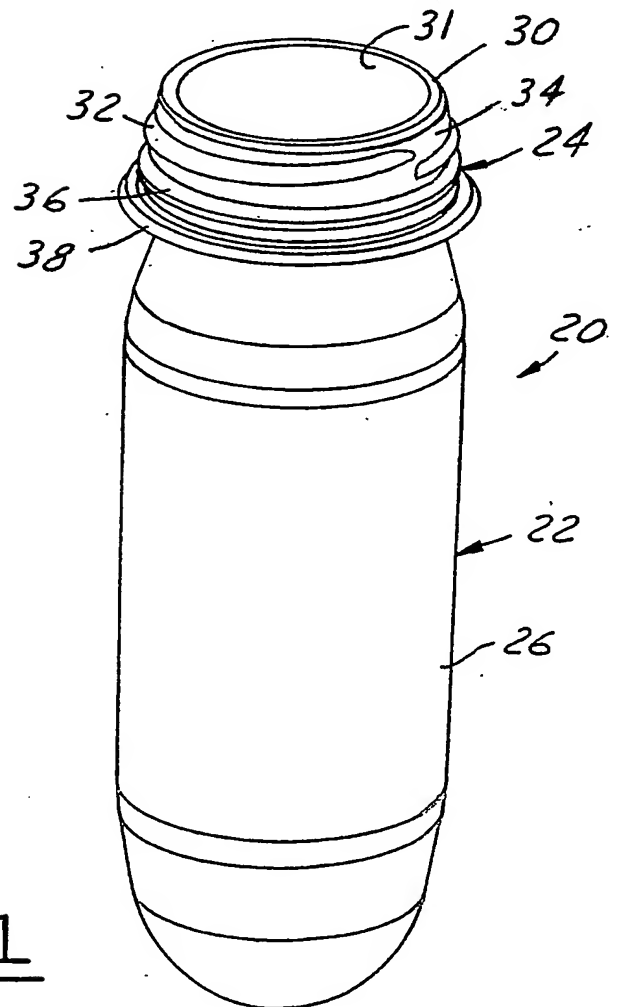
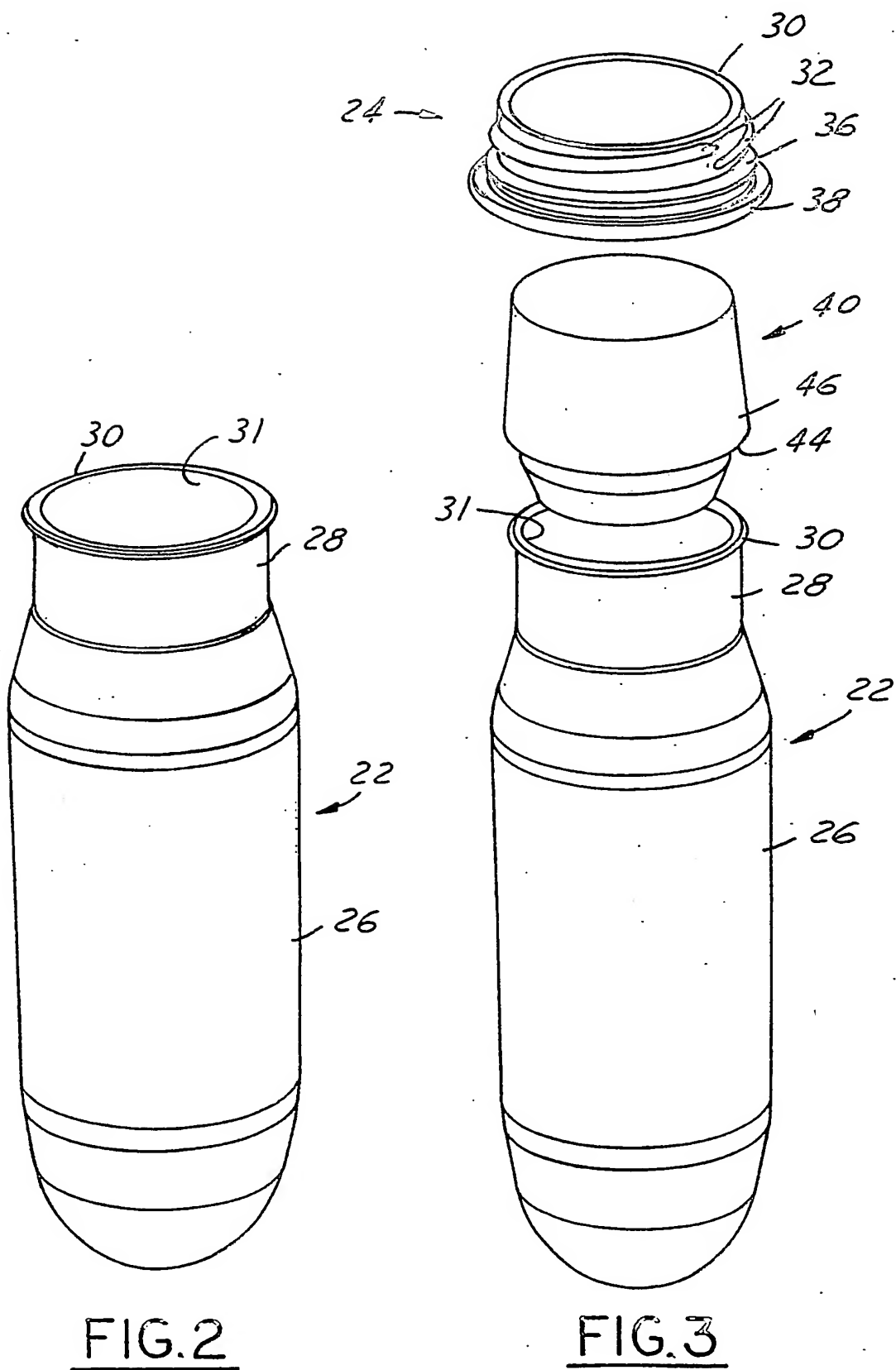


FIG. 1

2/2

BEST AVAILABLE COPY



INTERNATIONAL SEARCH REPORT

PCT/US2004/005888

A. CLASSIFICATION OF SUBJECT MATTER
 IPC 7 B65D1/02 B29C49/02

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
 IPC 7 B65D B29C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
 EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 0 641 718 A (PLM AB) 8 March 1995 (1995-03-08) the whole document	1-11
X	PATENT ABSTRACTS OF JAPAN vol. 018, no. 065 (M-1554), 3 February 1994 (1994-02-03) -& JP 05 285943 A (DAINIPPON PRINTING CO LTD), 2 November 1993 (1993-11-02) abstract; figure 1	1,3-6, 10,11
A	US 3 787 547 A (MARCO L) 22 January 1974 (1974-01-22) column 2, line 4 - column 3, line 16 figures 1-4	1,7
A	JP 52 103283 A (YOSHINO KOGYOSH CO LTD) 30 August 1977 (1977-08-30) figures 1-3	1,7

☐ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

* Special categories of cited documents:

- *A* document defining the general state of the art which is not considered to be of particular relevance
- *E* earlier document but published on or after the international filing date
- *L* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- *O* document referring to an oral disclosure, use, exhibition or other means
- *P* document published prior to the international filing date but later than the priority date claimed

- *T* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- *X* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- *Y* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
- *G* document member of the same patent family

Date of the actual completion of the international search

19 July 2004

Date of mailing of the international search report

23/07/2004

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2
 NL - 2280 HV Rijswijk
 Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,
 Fax (+31-70) 340-3016

Authorized officer

Piolat, O

INTERNATIONAL SEARCH REPORT

Information on patent family members

PCT/US2004/005888

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
EP 0641718	A	08-03-1995	SE 508018 C2	10-08-1998
			AT 166843 T	15-06-1998
			DE 69410717 D1	09-07-1998
			DE 69410717 T2	08-10-1998
			DK 641718 T3	12-10-1998
			EP 0641718 A1	08-03-1995
			ES 2116569 T3	16-07-1998
			NO 943254 A	06-03-1995
			SE 9302844 A	04-03-1995
JP 05285943	A	02-11-1993	NONE	
US 3787547	A	22-01-1974	AU 475963 B2	09-09-1976
			AU 5259373 A	29-08-1974
			BE 796426 A2	07-09-1973
			CA 995160 A1	17-08-1976
			DE 2310230 A1	13-09-1973
			FR 2175094 A1	19-10-1973
			GB 1405061 A	03-09-1975
			HK 33576 A	11-06-1976
			IT 983498 B	31-10-1974
			JP 49007082 A	22-01-1974
			NL 7302910 A	11-09-1973
			US 3899096 A	12-08-1975
JP 52103283	A	30-08-1977	JP 1331423 C	14-08-1986
			JP 60017693 B	04-05-1985